INFLUENCE OF SALINE INTRUSION ALONG THE FRESH WATER COASTAL AQUIFERS OF CENTRAL KERALA-SOUTH INDIA

SYNOPSIS

INTRODUCTION

The coastal ecosystem is highly valuable to humankind and influenced them immensely from the dawn of civilization. Consequently major parts of the world population live and work very close to the sea coast. Many of the biological and social needs of humanity are readily met by these coastal zones. The coastal areas are ecologically dynamic zones of great biological diversity and rich resource potential. However these delicate ecosystems are highly vulnerable towards degradation such as shoreline changes, pollution and stress due the overpopulation. Another serious problem faced by the coastal zone is the migration of saline water into fresh water coastal aquifers. The main factor contributing to this problem is the decrease in the seaward flow of ground water due to the increased demand for fresh water in the coastal areas for domestic, industrial and other purposes. This deterioration of the fresh water quality due to saline intrusion is found to be more pronounced during summer days.

Situated towards the southern part of the west coast of India, the central Kerala coastal tract comprising Azhikkode of Thrissur District to Ponnani of Malappuram District is facing the serious problem of saline intrusion into fresh water coastal aquifers. Increasing demands for land and

housing due to rapidly growing population coupled with unscientific and non judicious exploitation of water resources are the main reasons for the depletion of ground water aquifer of the coastal tracts of the central Kerala. The increased demand of fresh water for various purposes and consequent depletion and changes in land use pattern leads to detrimental impact on the water quality of this region. Natural events like tsunami, sea erosion, hurricanes etc. also adversely affect the fresh water coastal aquifer zones. Deterioration of the water quality will lead to many health and agricultural hazards in the coastal environment. Further, the area under investigation includes many pilgrimage centers, tourism spots, beach gardens, resorts and ancient historical places. Hence a detailed investigation and constant evaluation of the aquifer conditions of the coastal tracts of central Kerala during pre monsoon, monsoon and post monsoon period is of much significance.

The study area extends between two important river mouths of Kerala, the Periyar and the Bharathappuzha, and forms an integral part of the Arabian Sea coast. The area stretches to 64 km in length and two km in width, between Azhikkode ($10^0$10’49” N – $76^0$09’12” E) of Thrissur District and Ponnani ($10^0$46’53” N – 75^0 54’06” E) of Malappuram District.

OBJECTIVES OF THE STUDY

The main objectives of the present study is to carry out a detailed investigation and critical evaluation of the aquifer conditions of the central Kerala coastal tract, which extends from Azhikkode in Thrissur District to Ponnani in the Malappuram District of Kerala, South India during pre monsoon, monsoon and post monsoon periods. The objectives of the present study are:

* **Water Quality Analysis: -** To carry out a detailed analysis of different physico – chemical parameters of the water samples collected from the various sampling stations of the study area during pre monsoon, monsoon and post monsoon seasons.

* **Water Quality Index (WQI) Studies: -** To calculate the Water Quality Index (WQI) using the estimated data of various water quality parameters.

* **Quality–Depth Index (QDI) Studies:-** To differentiate between the sensitive and insensitive salinity zones of the study area.

* **Water Table Fluctuation Studies:** - To find out the variations in the depth of water table during different seasons of the year with in the study area.

* **Rainfall Analysis:** - To study the relation between the rainfall recharge, water quality and water table fluctuations with in the study area.

* **Soil Sample Analysis:** - To identify the influence of soil chemistry, if any on the water quality of the study area

* **Study of the Effect of Salt Water Channels on Water Quality: -**To establish the impact salt water channels and canal systems of the study area on water quality parameters.

* **Comparison of Saline Intrusion:** - To compare the degree of saline intrusion between different zones with in the study area

* **Correlation Studies:**- To find out and establish correlation between different water quality parameters among zones with in the study area and also among different seasons.

* **Rejuvenation Techniques:**- To suggest methods to improve the water quality of the entire study area.

METERIALS AND METHODS

The present investigation comprises a detailed examination and critical evaluation of the aquifer conditions of the coastal tracts of central Kerala. The study involved rapid reconnaissance survey for getting a preliminary understanding about the terrain characteristics and its peculiarities. Collection of toposheets, imageries, delineation of different zones and identification of sample stations and preparation of the detailed location map of the study area comprises the first phase of the present investigation. Water samples were collected at definite intervals of the study period and physico-chemical analysis was carried out as per established standard techniques. Soil samples were also collected and analyzed to determine the soil characteristics. Measurement of water table level was carried out during the collection of water samples at definite intervals from different sampling stations of the area under investigation. The distance between different sampling stations and salinity sources such as salt water channels, canal systems and sea shore etc. were measured without error. Rain fall data pertaining to the study area for the particular study period has also collected.

RESULTS AND DISCUSSION

Using GIS technique IDW interpolation diagrams were prepared from different physico-chemical parameters and detailed analysis were carried out for the entire zones of the study area for pre monsoon, monsoon post monsoon seasons. Saline intrusion aspects of the study area were represented using the interpolation diagrams and other traditional methods. Water Quality Index (WQI) and Quality-Depth Index (QDI) were determined and discussed using graphical methods and GIS diagrams. Sensitive zones and insensitive zones of the study area were differentiated using the QDI values and distance of the saline sources. The effects of soil characteristics on the water quality were also discussed. The hydrographs were prepared to establish the relation between the natural recharging of aquifers and rate of rain fall of the terrain. Two factor analysis of variance was carried out with zone as first factor and season as second factor for testing the significance of water quality parameters among the zones and also among the seasons.

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